

CSSS/POLS 510 MLE Lab

Lab 8. Multinomial Logit

Minji Jeong

Housekeeping

- Homework 4 is due November 21 (Fri) 3:30pm
 - Answers may be reviewed in Lab 9
 - Grades will be posted the week after next
- Agenda
 - Review Homework 3
 - Preview Homework 4
 - Multinomial Logit

Preview homework 4

- ① Focus on ordered categorical regression; refer to the [code examples from Lab 7](#) for guidance.
- ② The most time-consuming aspect will be setting up the **correct hypothetical scenarios**. Ensure to review and perform sanity checks on your data objects.
- ③ Be careful with the data. Make sure it is **clean**, and confirm that the levels of the dependent variable are correctly defined and computed.

Simulating Qol: Multinomial Logit

- 1 Estimate: MLE $\hat{\beta}, \hat{\tau}$ and its variance $\hat{V}(\hat{\beta}, \hat{\tau})$
→ `optim()`, `multinom()`
- 2 Simulate estimation uncertainty from a multivariate normal distribution:
Draw $\tilde{\beta}, \tilde{\tau} \sim MVN[(\hat{\beta}, \hat{\tau}), \hat{V}(\hat{\beta}, \hat{\tau})]$
→ `MASS::mvrnorm()`
- 3 Create hypothetical scenarios of your substantive interest:
Choose values of X: $X_c \rightarrow \text{simcf}::\text{cfmake}(), \text{cfchange}() \dots$

Simulating QoI: Multinomial Logit

- 4 Calculate expected values:

$$\tilde{\pi}_c = g(X_c, \tilde{\beta})$$

- 5 Compute EVs, First Differences or Relative Risks

$$\text{EV: } \mathbb{E}(y = j | X_{c1}, \tilde{\beta})$$

→ `simcf::mlogitsimev()` ...

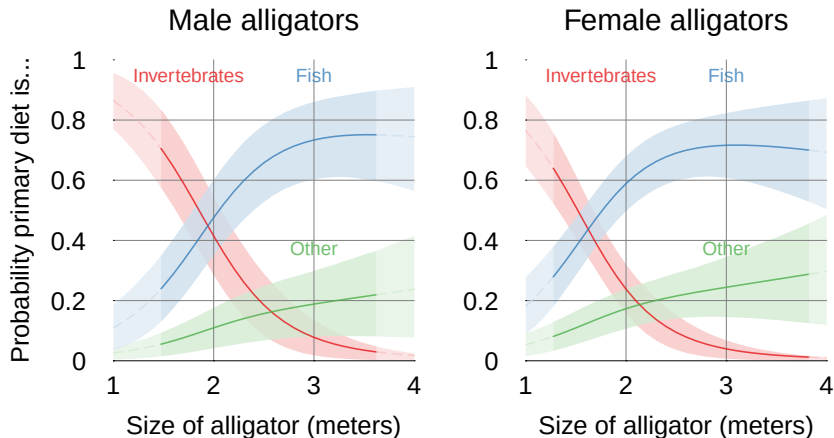
$$\text{FD: } \mathbb{E}(y = j | X_{c2}, \tilde{\beta}) - \mathbb{E}(y = j | X_{c1}, \tilde{\beta})$$

→ `simcf::mlogitsimfd()` ...

$$\text{RR: } \frac{\mathbb{E}(y=j | X_{c2}, \tilde{\beta})}{\mathbb{E}(y=j | X_{c1}, \tilde{\beta})}$$

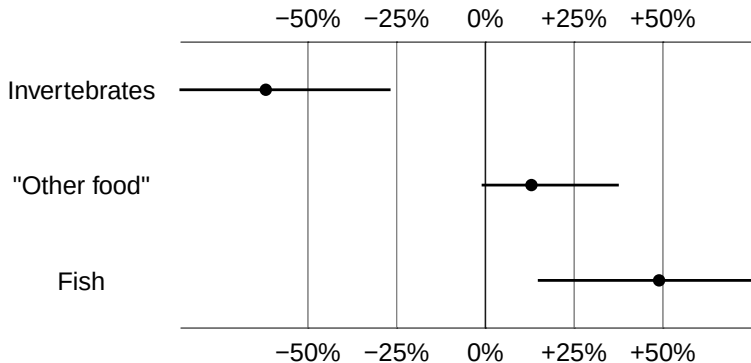
→ `simcf::mlogitsimrr()` ...

Multinomial Logit Preview: expected probabilities



Multinomial Logit Preview: first differences

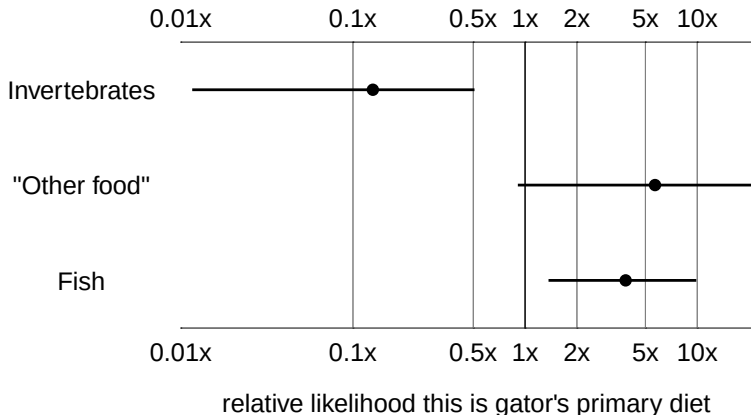
Large male gators (+1sd) compared to small (-1sd)



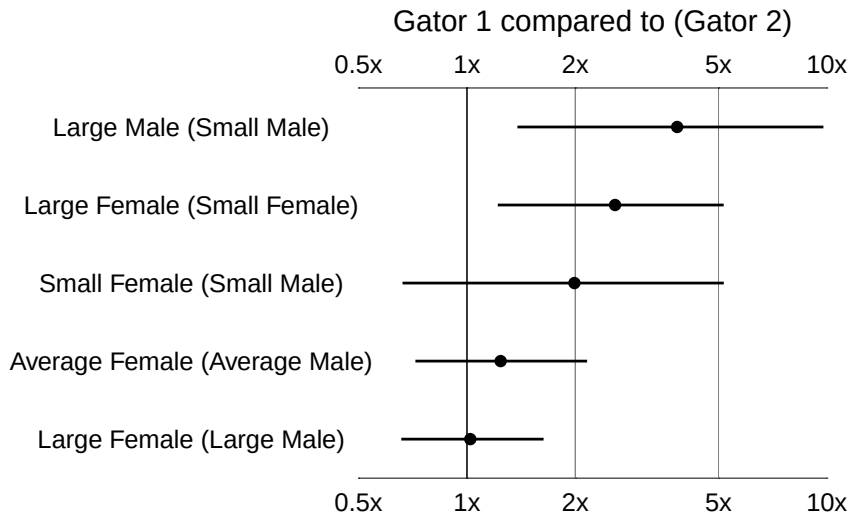
difference in probability this is gator's primary diet

Multinomial Logit Preview: relative risks

Large male gators (+1sd) compared to small (-1sd)



Multinomial Logit Preview: comparisons



Multinomial Logit Lab class

- Let's open RStudio and the [Lab8](#) file.

FIN